

CLAIMS

1 35. (currently amended) An integrated circuit having an image sensor, wherein the image
2 sensor has an array of one or more pixels, wherein at least one pixel in the array comprises:

3 (a) a photoelement formed on a substrate and configured to generate an electrical signal in
4 response to incident light;

5 (b) associated circuitry formed on the substrate and configured to process the electrical
6 signal generated in the photoelement; and

7 (c) two or more insulator structures formed on the substrate and configured to inhibit flow of
8 electricity between at least one of (1) the photoelement and the associated circuitry and (2) the pixel and
9 an adjacent pixel in the array, wherein the two or more insulator structures comprise:

10 (i) an insulator layer between the substrate and at least one of (1) the photoelement
11 and (2) the associated circuitry; and

12 (ii) at least one lateral insulator structure between at least one of (1) the
13 photoelement and the associated circuitry and (2) the pixel and the adjacent pixel, wherein the at least
14 one lateral insulator structure is in direct physical contact with the insulator layer to form a contiguous
15 electrical isolation barrier, wherein:

16 at least part of the photoelement and at least part of the associated circuitry are
17 formed within a common insulator layer formed on the substrate, wherein a portion of the common
18 insulator layer corresponding to the photoelement has a thickness different from a thickness of a portion
19 of the common insulator layer corresponding to the associated circuitry.

1 36. (previously presented) The invention of claim 35, wherein:

2 the at least one lateral insulator structure is between the photoelement and the associated
3 circuitry; and

4 the contiguous electrical isolation barrier inhibits the flow of electricity between the
5 photoelement and the associated circuitry.

1 37. (currently amended) The invention of claim 36, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 38. (previously presented) The invention of claim 35, wherein:

2 the at least one lateral insulator structure is between the pixel and the adjacent pixel; and

3 the contiguous electrical isolation barrier inhibits the flow of electricity between the pixel and
4 the adjacent pixel.

1 39. (currently amended) The invention of claim 38, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 40. (previously presented) The invention of claim 38, wherein the one or more insulator
2 structures further comprises a second lateral insulator structure between the photoelement and the
3 associated circuitry and in direct physical contact with the insulator layer, wherein the contiguous
4 electrical isolation barrier further inhibits the flow of electricity between the photoelement and the
5 associated circuitry.

1 41. (currently amended) The invention of claim 40, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 42. (currently amended) The invention of claim 41, wherein:

2 the pixel further comprises a mask layer formed on top of at least some of the associated
3 circuitry, wherein the mask layer inhibits light incident at the associated circuitry from contributing to the
4 electrical signal at the photoelement; and

5 ~~at least part of the photoelement and at least part of the associated circuitry are formed within a~~
6 ~~common insulator layer formed on the substrate, wherein a~~ the portion of the common insulator layer
7 corresponding to the associated circuitry is thicker than ~~[[a]] the~~ portion of the common insulator layer
8 corresponding to the photoelement.

1 43. (previously presented) The invention of claim 42, wherein:
2 the image sensor is a CMOS image sensor;
3 the one or more insulator structures comprise an oxide of silicon;
4 the pixel further comprises a microlens positioned over the photoelement; and
5 the photoelement is a photodiode, a phototransistor, a photogate, photo-conductor, a
6 charge-coupled device, a charge-transfer device, or a charge-injection device.

1 44. (previously presented) The invention of claim 35, wherein:
2 the image sensor is a CMOS image sensor;
3 the one or more insulator structures comprise an oxide of silicon;
4 the pixel further comprises a microlens positioned over the photoelement; and
5 the photoelement is a photodiode, a phototransistor, a photogate, photo-conductor, a
6 charge-coupled device, a charge-transfer device, or a charge-injection device.

1 45. (previously presented) The invention of claim 35, wherein the pixel further comprises a
2 mask layer formed on top of at least some of the associated circuitry, wherein the mask layer inhibits
3 light incident at the associated circuitry from contributing to the electrical signal at the photoelement.

1 46-47. (Canceled)

1 48. (currently amended) The invention of claim ~~[[46]]~~ 35, wherein the portion of the
2 common insulator layer corresponding to the associated circuitry is thicker than the portion of the
3 common insulator layer corresponding to the photoelement.

1 49. (currently amended) A method for fabricating an integrated circuit having an image
2 sensor, wherein the image sensor has an array of one or more pixels, the method comprises, for at least
3 one pixel in the array, the steps of:

4 (a) forming a photoelement formed on a substrate and configured to generate an electrical
5 signal in response to incident light;

6 (b) forming associated circuitry formed on the substrate and configured to process the
7 electrical signal generated in the photoelement; and

8 (c) forming two or more insulator structures formed on the substrate and configured to
9 inhibit flow of electricity between at least one of (1) the photoelement and the associated circuitry and
10 (2) the pixel and an adjacent pixel in the array, wherein the two or more insulator structures comprise:

11 (i) an insulator layer between the substrate and at least one of (1) the photoelement
12 and (2) the associated circuitry; and

13 (ii) at least one lateral insulator structure between at least one of (1) the
14 photoelement and the associated circuitry and (2) the pixel and the adjacent pixel, wherein the at least
15 one lateral insulator structure is in direct physical contact with the insulator layer to form a contiguous
16 electrical isolation barrier, wherein:

17 at least part of the photoelement and at least part of the associated circuitry are
18 formed within a common insulator layer formed on the substrate, wherein a portion of the common

19 insulator layer corresponding to the photoelement has a thickness different from a thickness of a portion
20 of the common insulator layer corresponding to the associated circuitry.

1 50. (previously presented) The invention of claim 49, wherein:
2 the at least one lateral insulator structure is between the photoelement and the associated
3 circuitry; and
4 the contiguous electrical isolation barrier inhibits the flow of electricity between the
5 photoelement and the associated circuitry.

1 51. (currently amended) The invention of claim 50, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 52. (previously presented) The invention of claim 49, wherein:
2 the at least one lateral insulator structure is between the pixel and the adjacent pixel; and
3 the contiguous electrical isolation barrier inhibits the flow of electricity between the pixel and
4 the adjacent pixel.

1 53. (currently amended) The invention of claim 52, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 54. (previously presented) The invention of claim 52, wherein the one or more insulator
2 structures further comprises a second lateral insulator structure between the photoelement and the
3 associated circuitry and in direct physical contact with the insulator layer, wherein the contiguous
4 electrical isolation barrier further inhibits the flow of electricity between the photoelement and the
5 associated circuitry.

1 55. (currently amended) The invention of claim 54, wherein the insulator layer is between
2 the substrate and both the photoelement and the associated circuitry[[:]].

1 56. (currently amended) The invention of claim 55, wherein:
2 the pixel further comprises a mask layer formed on top of at least some of the associated
3 circuitry, wherein the mask layer inhibits light incident at the associated circuitry from contributing to the
4 electrical signal at the photoelement; and
5 ~~at least part of the photoelement and at least part of the associated circuitry are formed within a~~
6 ~~common insulator layer formed on the substrate, wherein a~~ the portion of the common insulator layer
7 corresponding to the associated circuitry is thicker than [[a]] the portion of the common insulator layer
8 corresponding to the photoelement.

1 57. (previously presented) The invention of claim 56, wherein:
2 the image sensor is a CMOS image sensor;
3 the one or more insulator structures comprise an oxide of silicon;
4 the pixel further comprises a microlens positioned over the photoelement; and
5 the photoelement is a photodiode, a phototransistor, a photogate, photo-conductor, a
6 charge-coupled device, a charge-transfer device, or a charge-injection device.

1 58. (previously presented) The invention of claim 49, wherein:
2 the image sensor is a CMOS image sensor;
3 the one or more insulator structures comprise an oxide of silicon;
4 the pixel further comprises a microlens positioned over the photoelement; and

5 the photoelement is a photodiode, a phototransistor, a photogate, photo-conductor, a
6 charge-coupled device, a charge-transfer device, or a charge-injection device.

1 59. (previously presented) The invention of claim 49, wherein the pixel further comprises a
2 mask layer formed on top of at least some of the associated circuitry, wherein the mask layer inhibits
3 light incident at the associated circuitry from contributing to the electrical signal at the photoelement.

1 60-61. (canceled)

1 62. (currently amended) The invention of claim ~~[[60]]~~ 49, wherein the portion of the
2 common insulator layer corresponding to the associated circuitry is thicker than the portion of the
3 common insulator layer corresponding to the photoelement.